

7-3 Reteaching

Logarithmic Functions as Inverses

A logarithmic function is the inverse of an exponential function.

To evaluate logarithmic expressions, use the fact that $x = \log_b y$ is the same as $y = b^x$. Keep in mind that $x = \log y$ is another way of writing $x = \log_{10} y$.

Problem

What is the logarithmic form of $6^3 = 216$?

Step 1 Determine which equation to use.

The equation is in the form $b^x = y$.

Step 2 Find x , y , and b .

$b = 6$, $x = 3$, and $y = 216$

Step 3 Because $y = b^x$ is the same as $x = \log_b y$, rewrite the equation in logarithmic form by substituting for x , y , and b .

$3 = \log_6 216$

Exercises

Write each equation in logarithmic form.

1. $4^{-3} = \frac{1}{64}$
 $\log_4 \frac{1}{64} = -3$

2. $5^{-2} = \frac{1}{25}$
 $\log_5 \frac{1}{25} = -2$

3. $8^{-1} = \frac{1}{8}$
 $\log_8 \frac{1}{8} = -1$

4. $11^0 = 1$
 $\log_{11} 1 = 0$

5. $6^1 = 6$
 $\log_6 6 = 1$

6. $6^{-3} = \frac{1}{216}$
 $\log_6 \frac{1}{216} = -3$

7. $17^0 = 1$
 $\log_{17} 1 = 0$

8. $17^1 = 17$
 $\log_{17} 17 = 1$

Problem

What is the exponential form of $4 = \log_5 625$?

Step 1 Determine which equation to use.

The equation is in the form $x = \log_b y$.

Step 2 Find x , y , and b .

$x = 4$, $b = 5$, and $y = 625$

Step 3 Because $x = \log_b y$ is the same as $y = b^x$, rewrite the equation in exponential form by substituting for x , y , and b .

$625 = 5^4$

7-3 Reteaching (continued)

Logarithmic Functions as Inverses

Exercises

Write each equation in exponential form.

9. $3 = \log_2 8$ $2^3 = 8$

10. $2 = \log_5 25$ $5^2 = 25$

11. $\log 0.1 = -1$ $10^{-1} = 0.1$

12. $\log 7 \approx 0.845$ $10^{0.845} \approx 7$

13. $\log 1000 = 3$ $10^3 = 1000$

14. $-2 = \log 0.01$ $10^{-2} = 0.01$

15. $\log_3 81 = 4$ $3^4 = 81$

16. $\log_{49} 7 = \frac{1}{2}$ $49^{\frac{1}{2}} = 7$

17. $\log_8 \frac{1}{4} = -\frac{2}{3}$ $8^{-\frac{2}{3}} = \frac{1}{4}$

18. $\log_2 128 = 7$ $2^7 = 128$

19. $\log_5 \frac{1}{625} = -4$ $5^{-4} = \frac{1}{625}$

20. $\log_6 36 = 2$ $6^2 = 36$

Problem

What is the value of $\log_4 32$?

$x = \log_4 32$ Write the equation in logarithmic form $x = \log_b y$.

$32 = 4^x$ Rewrite in exponential form $y = b^x$.

$2^5 = (2^2)^x$ Rewrite each side of the equation with like bases in order to solve the equation.

$2^5 = 2^{2x}$ Simplify.

$5 = 2x$ Set the exponents equal to each other.

$x = \frac{5}{2}$ Solve for x .

$\log_4 32 = \frac{5}{2}$

Exercises

Evaluate the logarithm.

21. $\log_2 64$ **6**

22. $\log_4 64$ **3**

23. $\log_3 3^4$ **4**

24. $\log 10$ **1**

25. $\log 0.1$ **-1**

26. $\log 1$ **0**

27. $\log_8 2$ $\frac{1}{3}$

28. $\log_{32} 2$ $\frac{1}{5}$

29. $\log_9 3$ $\frac{1}{2}$